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C-A OPERATIONS PROCEDURES MANUAL

6.2.2 Linac Systems Resets

Text Pages 2 through 10

Hand Processed Changes

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 Collider-Accelerator Department Chairman Date

V. LoDestro

6.2.2 Linac Systems Reset

1. Purpose

To provide instructions for MCR Operators on how to reset various Linac systems after a system electrical trip or malfunction.

2. Responsibilities

MCR Operators can reset the Linac systems.

3. Prerequisites

3.1 This procedure assumes that the Linac has been running, and a system has tripped off due to a routine malfunction, power dip, etc.

3.2 A trained and qualified MCR Operator.

4. Precautions

None

5. Procedure

5.1 To reset a Linac cavity rf system:

5.1.1 Identify which rf system is down from the "RF mispulse" malfunction lights in the Linac Control Room (LCR), rack F6. (This can be done from MCR via the TV camera). Try to reset the system from MCR. If a reset from MCR is unsuccessful, one must do the reset at the appropriate rf station in the linac.

5.1.2 At the 4616 Driver cabinet, check to see if the filament is on. If so, proceed to step 5.1.3. If not, do the following:

5.1.2.1 If there is no malfunction indicated on the filament turn on switch (Driver AC Logic bucket), turn on the 4616 filament.

5.1.2.2 Check that 6.3 VAC is showing on the 7651 filament meter.

5.1.2.3 Check that 120 V is showing on the 7651 grid bias meter.

5.1.2.4 The 4616 filament current should be rising to 470 A. Within 2 minutes, the red "ON" light in the Driver AC Logic bucket should come on.

- 5.1.3 At the Power Amplifier Filament cabinet, check if the 7835 filament is on. If so, proceed to step 5.1.4. If not, do the following:
- 5.1.3.1 If there is no malfunction indicated on the filament turn on switch, turn on the 7835 filament.
- 5.1.3.2 The voltage and current should begin rising smoothly. Within 5 minutes, the voltage should stop at 4.7 V and the current should stop at 6,800 A. The "on" light should come on.
- 5.1.4 At the Modulator cabinet, check if the "on" light is on in the Modulator AC Logic bucket. If so, proceed to step 5.1.5. If not, do the following:
- 5.1.4.1 If there is no malfunction indicated on the filament turn on switch, turn on the modulator filaments.
- 5.1.4.2 Push the reset button on the modulator SCR control bucket.
- 5.1.4.3 From the SCR control bucket, check that the grid deck voltage is rising to 110 VAC, the LPT filament current should rise to 190 A, and the 8618 filament current should rise to 310 A.
- 5.1.4.4 Within 3-5 minutes, the "on" light should come on the Modulator AC Logic bucket.
- 5.1.5 At this point, the "Master On" light should be lit on the Master Filament bucket at the Local Control Station (LCS). Any malfunctions will be indicated by a light, and must be corrected.
- 5.1.6 The 4616 HV turn on switch is located in the Driver HV Logic bucket. If the HV is on, proceed to step 5.1.7. If not, and a malfunction is indicated on this switch, try and clear the malfunction by pressing the reset button. When there is no malfunction, turn on the supplies. (If the malfunction cannot be cleared, call a system expert). Once the Driver HV is turned on, check the following:
- The 7651 Screen Grid comes to 600 V.
 - The 7651 Anode comes to 4.5 kV.
 - The 4616 Bias comes to 250 vdc.
 - The 4616 Anode comes to about 17 kV.
 - The 4616 Screen comes to about 2 kV.

- 5.1.7 At the "Pulsing Turn on" bucket at the LCS, if the pulsing light is "on", proceed to step 5.1.8. If a malfunction is indicated, press the reset button to try and clear the malfunction. When no malfunction is indicated on the pulsing turn on switch, then turn on pulsing. Once pulsing is turned on, the red "on" light will come on, and the 4616 will be running.
- 5.1.8 At the 50 kV Power Supply Redi Panel at the LCS rack A15, and on the Panel View Screen located in rack A14, if the high voltage ON light is on, proceed to step 5.1.9. If not, switch the power supply to LOCAL CONTROL at the Redi Panel.
 - 5.1.8.1 Push the STBY RESET button on the Redi Panel or F2 on the Panel View screen.
 - 5.1.8.2 All malfunction indications should turn green at the Panel View, all the HV Vac Contactor (Jennings) lights, should go out on the High Voltage Logic Bucket. The Cap Bank should charge to its last setting.
 - 5.1.8.3 At the Redi Panel return the PS to remote control.
- 5.1.9 If all the malfunction lights go out, the RF system is ready to run. If a malfunction light remains on, check the following LCS monitors:
 - 5.1.9.1 The tank probe should be 0.2 V peak in amplitude, at the correct Gradient Detector Bias (slideback).
 - 5.1.9.2 The fast phase loop should be nulled.
 - 5.1.9.3 The reference to tank Phase Loop Monitor should be nulled. This monitor indicates a change in the relative RF phase of the accelerating cavity to the low level reference RF. Contact the Linac Operations Coordinator prior to adjustment.
 - 5.1.9.4 "Driver Rev Pwr" in the Pulsing Logic bucket should be < 1 V.
 - 5.1.9.5 Power Amp Rev Pwr should be < 1 V.
 - 5.1.9.6 Low energy loop rev pwr should be < 0.5 V.
 - 5.1.9.7 High energy loop rev pwr should be < 0.5 V.

5.1.10 If the RF system cannot be brought up to correct power levels, call a system specialist.

5.2 To reset a buncher rf system:

5.2.1 Buncher 2 & 3 Local Control Stations are located in Mod #10. Buncher 1 is located in rack #4 to the left of the RFQ controls outside the Linac Control Room. Go to the appropriate station and select the Buncher on the Panel View Display Screen, press F17 or F18. If a malfunction is indicated, hit LAMP RESET F4.

5.2.2 If the filaments are off, press F3, AC Turn On. A 2-minute time delay will be initiated. After which the high voltage malfunction will clear. Press F7 HV ON. The Buncher should now be operating. If problems persist, call a system specialist.

5.3 To reset the RFQ:

5.3.1 The RFQ LCS is located at the Panel View Terminal in rack #5, Linac RFQ1 Monitoring. Select F17, RFQ! Control Screens. If F3 is ON, lit red, on the RFQ AC Logic Screen, proceed to 5.3.2. Otherwise press F5, Lamp Reset, and F3 ON. Move on to the HV Logic Screen. A two-minute delay will count down clearing the AC Logic Malfunction.

5.3.2 If the HV Logic is ON proceed to step 5.3.3. Otherwise, push F5, Lamp Reset and F7 Crowbar Reset. Pushing F3 will turn on the HV. The RFQ Cap Bank will charge to the last dial setting of the 4616 Anode PS Regulator chassis located in the right hand door of the equipment cabinet.

5.3.3 On the RF Pulsing Bucket, located in the equipment cabinet just to the left of the Driver Cart, clear any malfunction by pressing the reset button, then turn on the RF Pulsing. If all malfunction lights go out, the AFC Loop is auto locking, the RFQ should now be operating. Monitor at rack #5 the following:

5.3.4.1 RF Gradient, amplitude is .2 Volts @ 260 on the slide-back detector.

5.3.4.2 Phase Control Loop is nulled.

5.3.4.3 Phase Monitor Loop is nulled.

5.3.4.4 4616 IN; Fwr. Power >3.0 v. & Rev. Power <.5 v.

5.3.4.5 4616 Out: Fwr. >8.0 v, Rev. Power <1.0 volt

5.3.5 If problems persist and RFQ is still not operating at the correct level or sparking is noticed in the 4616 anode cavity, coax or RFQ 1 cavity, do not restart. Refer condition to a system specialist.

5.4 To reset the Linac ion pumps:

5.4.1 There is an "Inline Vacuum Valve Status" panel in rack F7 in the Linac control room. If a "pumps on" light is not lit, this means that one or more of the tank ion pumps has tripped off. In some cases, this will cause an inter-tank valve to close, and beam will be inhibited. One can first attempt to reset the pumps by pushing the appropriate reset button above the indicator light. If the pumps come back on, the intertank valves will reopen automatically. If the "BLIP pumps on" light is out, reset with the "B1" and "B2" buttons. In this case, the BLIP valves must then be reopened by pressing the "B&G BLIP" valve reset button.

5.4.2 If all pumps do not reset after several tries, one must do the reset from the vacuum racks in the lower equipment bay of the linac. The ion pump control panels are located opposite the Mod 7 quadrupole pulsers. First check the three "High Voltage Power Supply Control" switches, and if any are off, turn them back on. Then, one can attempt to reset any pumps by pressing the appropriate reset button for that pump. Even if all pumps can not be brought back on, if the inter-tank valves are open, one can continue running.

5.5 To reset LEBT solenoid pulsers:

The LEBT solenoid pulsers are located in equipment racks in the Pit 1 area, near the ion source power supplies. A momentary interruption of water flow to the solenoids can cause the supplies to trip, and they must be manually reset. First, check for a malfunction on the "Solenoid Magnet Interlock" panel, located in rack #4. There is no interlock reset, since they clear if the reason for the malfunction has cleared. To turn the solenoid back on, one must simply push the "on" button on the "LEBT Solenoid Turn on" panel, located in rack #5.

5.6 To reset the source extractor power supply:

5.6.1 The extractor supply is located in the Pit 1 area, by the ion source. First check the extractor interlock lights in the box mounted to the source stand behind the extractor supply. If all lights are out, all interlocks are cleared.

5.6.2 Press the "CONTROL" button on the front panel of the supply. Press and hold the "PULSER" button for approximately 5 seconds, until the fan relay comes on. A time delay in the supply will then take about 5 minutes to clear. Check the indicator lights for the supplies in the extractor rack. The low level supplies (± 15 and $+5$) are monitored on the front panel. Lights for the supplies in the floating grid deck

(+5, ±15, +120, ±400) can be viewed from the safety window on the front panel.

- 5.6.3 One can leave the "local/remote" switch on the Glassman power supply in the "remote" position. Run the voltage knob down to zero. Turn on the power supply high voltage. Then, the voltage can be raised while monitoring the extractor for arcing. (Arcing can be monitored either by observing the beam pulse or the extractor voltage pulse on a scope). Raise the voltage as far as possible until arcing begins, then slowly try to raise it until you get back to the 35 kV operating level. (The longer the supply has been off, the longer it may take to get the supply back up to full voltage). Once at 35 keV, raise the Glasman supply voltage knob to its full value, since the actual setpoint will now be determined by the Apollo spreadsheet setpoint.

5.7 To reset HEBT quads and steerers:

- 5.7.1 The HEBT power supplies are located in the lower equipment bay by Mod 9. Check the HEBT malfunction lights in rack A6A4. All lights should be blinking when the quads are off, indicating that all malfunction circuits are working.
- 5.7.2 The HEBT quad turn on button is in rack A12. If the switch does not indicate a malfunction turn on the supplies. The HEBT quads can also be turned on from a switch in the Linac control room, rack F7, and the PLC RS View Control PC, click on "H" STBY then ON.. If a malfunction is indicated, check that the BLIP water is on and that the transport water is on (indicators in rack A12).
- 5.7.3 In about 2-5 minutes after turn on of the supplies, all malfunction lights should be out. If a light remains on, check the corresponding supply. If a supply is bad, turn off all supplies and follow the posted spare PS replacement procedure.

5.8 To reset LTB quads and dipoles:

- 5.8.1 The LTB power supplies are located in Bldg.930UEB (Upper Equipment Bay). If an alarm on the Alarm Display Task (ADT) screen appears, reset the alarming supply via spreadsheet, at location Booster Injection LTB. If Remote turn on fails, check for faults locally.
 - 5.8.1.1 In 930UEB, locate the alarming supply and note any faults indicated on the front annunciator panel. Reset the faults once and have an operator in the MCR attempt to bring the supply on remotely. If unsuccessful, check that the relays located inside the front control panel and the breaker located on the rear panel of the supply are reset.

- 5.8.3 If the supply continues to malfunction, inform the Operations Coordinator, and use the appropriate call in list to get an expert to examine the problem.

5.9. To reset LEBT and Tank pulsed quads:

- 5.9.1 Power supplies and controls for quadrupoles in each tank are located along the lower equipment bay, the LEBT LCS is located in the upper equipment bay.
- 5.9.2 Check that all quadrupole malfunction lights are blinking (indicating that all malfunction circuits are working).
- 5.9.3 If the quad turn on switch does not indicate a malfunction turn on the supplies. The tank and LEBT quads can also be turned on from a switch in the LCR, rack F7. If a malfunction is indicated, check that the tank cooling water is on.
- 5.9.4 In about 2-5 minutes after turn on of the supplies, all malfunction lights should be out. If a light remains on, check the corresponding pulsed supply. If a supply is bad, turn off all supplies for that tank or LEBT, and follow the posted spare replacement procedure.

5.10 To reset BM 1&2 and the BLIP Quads:

5.10.1 Reset BM1 and BM2 power supplies by doing the following:

- 5.10.1.1 Check the BLIP Hardwired Interlock panel, located in the LEB, Lower Equipment Bay, at rack A14, all red lights on. If not, then all BLIP facility interlocks aren't cleared and BM1/2 won't come on. Contact a member of the BLIP staff to investigate.
- 5.10.1.2 If there is no malfunction indicated, turn on the BM1 PS with the button located in rack A12. BM1 can also be turned from a button in the Linac control room, rack F7. If a malfunction is indicated, check that the BLIP water is on.
- 5.10.1.3 BM 2 can be turned on locally at the PS in the LEB HEBT area, push RESET Button, STBY then ON. It can also be reset in the Linac Control Room from the PLC RS View Control PC, click on BH 2, STBY then ON.
- 5.10.1.4 Within 2-5 minutes, the "BM2 current malfunction" light in rack M16A2A2, and the "BLIP malfunction" light in rack A1A2 should go out. If a light remains on, check the

corresponding supply. If a supply is bad, turn off both supplies and contact a system expert to checkout the supply.

5.10.2 Reset the BLIP quadrupoles and steerers by doing the following:

5.10.2.1 The BLIP quad turn on button is in rack M9A3. If the switch does not indicate a malfunction turn on the supplies. The BLIP Quads can also be turned on by a switch in the Linac control room, rack F7. If a malfunction is indicated, check that the BLIP water is on and that the BLIP temperature panel is reset. Both can be checked on the panel on the HEBT SE wall, just upstream of the exit door.

5.10.2.2 In about 2-5 minutes after turn on of the supplies, all malfunction lights should be out. If a light remains on, check the corresponding supply. If a supply is bad, turn off all supplies and follow the posted spare replacement procedure.

5.11 LC Controls Reset for RF LCS's Mods 1 through 9, which have been modified to PLC control.

5.11.1 From the Panel View Terminal, select F16, MAIN SCREEN. From the Main Screen you can select any RF subsystem you want to reset.

5.11.1.1 Select F1-Driver

5.11.1.2 Select F2-7835 Filament PS

5.11.1.3 Select F3-Modulator

5.11.1.4 Select F4-Capacitor Bank

Select F5-50 KV Power Supply

5.11.2 Pushing F2, STBY/REST, can reset driver Filaments. A 2-minute time delay will be initiated. After which the HV can be turned on, select F3 ON. Hit the reset button on the Pulsing Turn On Logic Bucket if you have a STOP CHARGE malfunction prior to HV turn on.

5.11.3 Selecting F2 can reset 7835 Filament PS malfunctions. Pressing F3 will then turn the PS on. A 2-minute time delay will be initiated.

5.11.4 Pressing F3 RESET can reset modulator malfunctions. Selecting F2 MOD ON will initiate a 2-minute time delay prior to coming on.

5.11.5 To reset the Cap Bank malfunctions, press F1 FAULT RESET.

5.11.6 50 KV PS's have been converted to PLC control on all Mods, refer to 5.1.8 for reset. 50 KV PS can also be reset in the Linac Control Room's PLC Review PC. Select the Mod #, click STBY to reset the PS fault, click ON to turn on the HV.

6. Documentation

None

7. References

7.1 [C-A-OPM 8.1.6](#), "Cavity RF Systems Turn On".

7.2 [C-A-OPM 8.1.8](#), LEBT Bunchers Turn On".

7.3 [C-A-OPM 8.1.7](#), Turn On of RFQ 1".

8. Attachments

None